SPECIAL ISSUE

SOIL STRUCTURE/SOIL BIOTA INTERRELATIONSHIPS

International Workshop on Methods of Research on Soil Structure/Soil Biota Interrelationships, held at the International Agricultural Centre, Wageningen, The Netherlands, 24–28 November, 1991

Edited by

L. BRUSSAARD[a,b] and M.J. KOOISTRA[c]

[a]*Department of Soil Science and Geology, Wageningen Agricultural University, P.O. Box 37, 6700 AA Wageningen, The Netherlands*

[b]*Department of Soil Biology, DLO – Institute for Soil Fertility Research, P.O. Box, 30003, 9750 RA Haren, The Netherlands*

[c]*Department of Soil Structure and Micromorphology, DLO – The Winand Staring Centre for Integrated land, Soil and Water Research, P.O. Box 125, 6700 AC Wageningen, The Netherlands*

Part A: Sessions I and II

CONTENTS

Editor's Introduction ix
Sponsors xii
Preface xiii
Opening Address xv

Session I. Soil features: observation, description and quantification of soil biota in situ; effects of soil biota on soil structure and soil structure on biota

Invited papers
Methods for the study of interrelationships between micro-organisms and soil structure
J.F. Darbyshire, S.J. Chapman, M.V. Cheshire, J.H. Gauld, W.J. McHardy, E. Paterson and D. Vaughan 3
Observing soil biota in situ
J. Lussenhop and R. Fogel 25

Contributed papers
Distribution and dynamics of shrub roots in recent coastal dune valley ecosystems of Belgium
C. Ampe and R. Langohr 37
Transformation of the soil structure through *Pontoscolex corethrurus* (Oligochaeta) intestinal tract
I. Barois, G. Villemin, P. Lavelle and F. Toutain 57
Influence of fir root zone on soil structure in a 23 m forest transect: the fractal approach
F. Bartoli, G. Burtin, R. Philippy and F. Gras 67

A comparison of methods for measuring water-stable aggregates: implications for determining environmental effects on soil structure
M.H. Beare and R.R. Bruce 87
Water repellency of sieve fractions from sandy soils and relationships with organic material and soil structure
E.B.A. Bisdom, L.W. Dekker and J.F.Th. Schoute 105
The physical structure of casts of *Millsonia anomala* (Oligochaeta: Megascolecidae) in shrub savanna soils (Côte d'Ivoire)
E. Blanchart, A. Bruand and P. Lavelle 119
Use of the minirhizotron–miniature video camera technique for measuring root dynamics
J.E. Box Jr. 133
Clay– or sand–polysaccharide associations as models for the interface between micro-organisms and soil: water related properties and microstructure
C. Chenu 143
Quantification of fungal morphology, gaseous transport and microbial dynamics in soil: an integrated framework utilising fractal geometry
J.W. Crawford, K. Ritz and I.M. Young 157
Some population sizes and effects of the Enchytraeidae (Oligochaeta) on soil structure in a selection of Scottish soils
V. Dawod and E.A. FitzPatrick 173
The role of roots, fungi and bacteria on clay particle organization. An experimental approach
J.M. Dorioz, M. Robert and C. Chenu 179
Micro-morphological studies on clay-amended and unamended loamy sand, relating survival of introduced bacteria and soil structure
C.E. Heijnen, C. Chenu and M. Robert 195
Earthworm burrow system development assessed by means of X-ray computed tomography
M. Joschko, P.C. Müller, K. Kotzke, W. Döhring and O. Larink 209
Roughness of soil pore surface and its effect on available habitat space of microarthropods
C. Kampichler and M. Hauser 223
Size and orientation of burrows made by the earthworms *Aporrectodea rosea* and *A. caliginosa*
B.M. McKenzie and A.R. Dexter 233
Relationships between soil porosity, root development and soil enzyme activity in cultivated soils
M. Pagliai and M. De Nobili 243
Semi-automatic image analysis of earthworm activity in 2D soil sections
S. Schrader 257
Synlocation of biological activity, roots, cracks and recent organic inputs in a sugar beet field
M. van Noordwijk, P.C. De Ruiter, K.B. Zwart, J. Bloem, J.C. Moore, H.G. van Faassen and S.L.G.E. Burgers 265
Root–soil contact of field-grown winter wheat
M. van Noordwijk, D. Schoonderbeek and M.J. Kooistra 277
The influence of Enchytraeidae (Oligochaeta) on the soil porosity of small microcosms
P.C.J. van Vliet, L.T. West, P.F. Hendrix and D.C. Coleman 287
Estimating orientation and width of channels and cracks at soil polished blocks—a stereological approach
H.J. Vogel, U. Weller and U. Babel 301

Round tables
Measurement of proliferation and biomass of fungal hyphae and roots
J. Dighton and M. Kooistra 317
Biological and physico-chemical processes in excrements of soil animals
A. Martin and J.C.Y. Marinissen 331

Session II. Soil processes: translation of soil features into biologically mediated processes

Invited papers

Concepts and methods for studying interactions of roots and soil structure
M.van Noordwijk, G. Brouwer and K. Harmanny 351
The role of biology in the formation, stabilization and degradation of soil structure
J.M. Oades 377
Soil structure: carbon and nitrogen metabolism
J.N. Ladd, R.C. Foster and J.O. Skjemstad 401

Contributed papers

Effects of biocidal treatments on biological and nutritional properties of a mull-structured woodland soil
J. Alphei and S. Scheu 435
Methods for physical separation and characterization of soil organic matter fractions
C.A. Cambardella and E.T. Elliott 449
Influence of content and nature of organic matter on the structure of some sandy soils from West Africa
Ph. Dutartre, F. Bartoli, F. Andreux, J.M. Portal and A. Ange 459
Effect of inoculation with *Bacillus polymyxa* on soil aggregation in the wheat rhizosphere: preliminary examination
L. Gouzou, G. Burtin, R. Philippy, F. Bartoli and T. Heulin 479
Soil aggregates as microcosms of bacteria–protozoa biota
R. Hattori and T. Hattori 493
Aggregate stability and soil microbial processes in a soil with different cultivation
E. Kandeler and E. Murer 503
Carbon distribution in different compartments of forest soils
I. Kögel-Knabner and F. Ziegler 515
Phosphorus mineralization during laboratory incubation in soils derived from different textured parent materials
D. López-Hernández and M. Niño 527
An improved sieving machine for estimation of soil aggregate stability (SAS)
E.J. Murer, A. Baumgarten, G. Eder, M.H. Gerzabek, E. Kandeler and N. Rampazzo 539
Direct measurements of oxygen microprofiles and distribution of phospholipid-P in a two-phase soil–manure system
S.O. Petersen, T.H. Nielsen and K. Henriksen 549
Modelling diffusion and microbial uptake of ^{13}C-glucose in soil aggregates
E. Priesack and G.M. Kisser-Priesack 561
Analysis of the microbial nutrient status in soil microcompartments: earthworm faeces from a basalt–limestone gradient
S. Scheu 575
The influence of soil compaction on microbial biomass and organic carbon turnover in micro- and macroaggregates
H. Šantrůčková, O. Heinemeyer and E.-A. Kaiser 587
Immediate effect of wetting event on microbial biomass and carbohydrate production-mediated aggregation in desert soil
S. Sarig and Y. Steinberger 599
A microcosmic approach to compare effects of constant and varying temperature conditions on soil structure/soil biota interrelationships
A.V. Uvarov 609
Microbial biomass and activity in soils with fluctuating water contents
M. Van Gestel, R. Merckx and K. Vlassak 617
Effects of burrowing by the earthworm *Aporrectodea caliginosa* (Savigny) on beech litter

decomposition in an agricultural and in a forest soil
V. Wolters and M. Schaefer 627
The effect of location in soil on protozoal grazing of a genetically modified bacterial inoculum
D.A. Wright, K. Killham, L.A. Glover and J.I. Prosser 633
Round tables
The relevance of soil physical measurements on the macroscale for the description of biological processes on the microscale — Introduction to round table discussion
D.E. Smiles 641

Part B: Session III, companion Volume 57(1/2)

CONTENTS

Session III, Evaluation of effects of soil feature and soil biological processes on soils and plants

Invited papers
Interrelationships between soil structure/texture, soil biota/soil organic matter and crop production
N.G. Juma 3
Gas, water and solute transport in soils containing macropores: a review of methodology
W.M. Edwards, M.J. Shipitalo and L.B. Owens 31
Simulation modelling as a method to study land qualities and crop productivity related to soil structure differences
J. Bouma and M.J.D. Hack-ten Broeke 51

Contributed papers
Modelling the geometry of worm burrow systems in relation with oxygen diffusion
C. Rappoldt 69
Relationships amongst organic matter content, heavy metal concentrations, earthworm activity, and soil microfabric on a sewage sludge disposal site
A.D. Tomlin, R. Protz, R.R. Martin, D.C. McCabe and R.J. Lagace 89
Relationships between soil texture, physical protection of organic matter, soil biota, and C and N mineralization in grassland soils
J. Hassink, L.A. Bouwman, K.B. Zwart, J. Bloem and L. Brussaard 105
A method for the three-dimensional mapping of earthworm burrow systems
T.N. Ligthart, G.J.W.C. Peek and E.J. Taber 129
Water movement, oxygen supply and biological processes on the aggregate scale
P.A. Leffelaar 143

Round tables
Round Table on water movement, oxygen supply, nutrient supply, and biological processes on the micro-scale
P.A.C. Raats 167
Translation of soil features across levels of spatial resolution — Introduction to round table discussion
J.F.Th. Schoute 171